

UCSI UNIVERSITY
B.ENG (HONS) IN PETROLEUM ENGINEERING TECHNOLOGY

COURSE OUTLINE

Subject name	Chemistry for Petroleum Engineering Technology I														
Subject code	EG 101														
Status	Major														
Credit hour	4														
Semester/Year	2/1														
Pre-requisite	None														
Teaching method	Lectures & Laboratory														
Assessment	<table> <tr> <td>Test 1</td><td>10%</td></tr> <tr> <td>Mid Term Examination</td><td>20%</td></tr> <tr> <td>Test 2</td><td>10%</td></tr> <tr> <td>Laboratory</td><td>10%</td></tr> <tr> <td>Final Examination</td><td>50%</td></tr> </table> The course has four assessment components as described above. Test 1: it will be conducted on week 5 of the semester. The test 1 will usually have 4 questions of approximately 15 minutes duration each. Midterm exam: it will be conducted on week 9 of the semester. The midterm exam will have 4 questions of approximately 20 minutes duration each. Test 2: it will be conducted on week 12 of the semester. The test 2 will usually have 4 questions of approximately 15 minutes duration each. Laboratory component: it is compulsory to attend all the lab sessions; failing to do so will result in complete failure in the subject. The student will carry out the experiments described below and submit a report to the lab tutor. Final Exam component: it will consist of 5 questions of 3 hours duration. <table> <tr> <td>40% ruling:</td><td>Applicable</td></tr> <tr> <td>Supplementary exam:</td><td>Applicable (on the final exam only)</td></tr> </table>	Test 1	10%	Mid Term Examination	20%	Test 2	10%	Laboratory	10%	Final Examination	50%	40% ruling:	Applicable	Supplementary exam:	Applicable (on the final exam only)
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Lecturer	Ms Tan Jully														
Objective	This class is a basic introductory to organic chemistry in chemical or petroleum engineering study. This unit aims to: 1. Provide the theory of elements organic chemistry. 2. Expose to the technique of naming organic compounds according to IUPAC method. 3. Provide the basic understands physical and chemical properties of the different organic compounds which include aliphatic hydrocarbon compounds, aromatic compounds and carbonyl compounds. 4. Provide and expose to the different type of chemical syntheses and reaction mechanisms of the aliphatic hydrocarbon compounds, aromatic compounds and carbonyl compounds. 5. Explain the importance of carbonyl compounds in industry. 6. Strengthen their knowledge by performing selected laboratory experiments.. 7. Pinpoint the basic analytical tools, such as Analytical separation techniques, Gas Chromatography, Spectro-photometric principles, HPLC and Atomic absorption.														
Course outcome	At the end of the course, students should be able to: 1. Explain the different type of hybridization. 2. Explain the different type of compound bonding. 3. Draw the lewis bonding structure.														

	4. Naming the organic compounds (aliphatic hydrocarbon compounds, aromatic compounds and carbonyl compounds) according to IUPAC methods. 5. Explain the physical and chemical properties of a specific organic compound ranging from aliphatic hydrocarbon compounds, aromatic compounds to carbonyl compounds. 6. Compare difference between organic compounds (aliphatic hydrocarbon compound, aromatic compound and carbonyl compounds) based on the physical and chemical properties. 7. Explain the syntheses mechanism of organic compound from a given compound (aliphatic hydrocarbon compounds, aromatic compounds and carbonyl compounds). 8. Explain the reaction mechanism of desired product from an compound. (aliphatic hydrocarbon compounds, aromatic compounds and carbonyl compounds). 9. Explain the basic analytical tools such as Analytical separation techniques, Gas Chromatography, Spectro-photometric principles, HPLC and Atomic absorption and its application.			
Syllabus & Contact hour	1. ALIPHATIC HYDROCARBONS – naming of hydrocarbons (IUPAC method), types of bond, reactivity of bonds, organic derivatives of hydrocarbons. 2. ALKANES and ALKENES: Recap and Reactions The alkene double bond: a focus of reactivity. Polar and concerted addition reactions. Hydrogenation, addition of HX (Markovnikov addition), halogenation. hydroboration (anti-Markovnikov addition) 3. ALKYNES: Structure and bonding Introduction to the alkyne triple bond. ALKYNES: Synthesis and Reactions Alkylation of acetylide anions (a carbon nucleophile) Addition reactions to alkynes, hydrogenation, halogenation and HX. Hydration of alkynes. 4. ALCOHOLS: Structure, synthesis and reactions Structure and bonding. Acidity (brief review), Synthesis of alcohols. Organometallic reagents, reactivity and basicity. Reaction of carbonyl compounds with Grignard and organolithium reagents .<i>REDOX</i> relationships amongst alcohols, aldehydes and ketones and carboxylic acids. Alcohols as nucleophiles (formation of alkoxides) and electrophiles. Esterification. 5. AROMATIC COMPOUNDS: Structure and Reactions, 2,3 and 4 pi electron systems .<i>Benzene</i> - the prototypic aromatic system."aromaticity" Huckel's rule. Identifying aromatic systems. Charged and neutral species. Polycyclics and heterocyclic. Reaction chemistry of aromatic compounds – electrophilic	<u>Lecture</u> 3 6 3 6 8	<u>Tutorial</u>	<u>Lab</u>

	aromatic substitution: halogenation, nitration, sulfonylation and Friedel-Crafts alkylation and acylation. Directing effects in electrophilic aromatic substitution .Nucleophilic aromatic substitution .Strategies in the synthesis of multisubstituted benzene derivatives. 6. CARBONYL COMPOUNDS: Summary of various types of carbonyl compounds – aldehydes and ketones, carboxylic acids and carboxylic acid derivatives (acid chlorides, acid anhydrides, esters and amides). Synthesis of aldehydes and ketones. Reactions of carbonyl compounds with the carbonyl group as an electrophile with H, C, N and O nucleophiles. 8. ANALYTICAL CHEMISTRY: Analytical separation techniques, Gas Chromatography, Spectrophotometric principles, HPLC and Atomic absorption.	6		
		10		
Total hour		42		28
Textbook	1. Organic Chemistry (Vol. 1 & II) 6 th Edition, by I.L. Finar, Longman Group Ltd. London. 2. Lecture's Note.			
Reference	1. Organic Chemistry, 9th Edition, T. W. Graham Solomons, University of South Florida, Craig B. Fryhle, Pacific Lutheran University. 2. March's Advance Organic Chemistry: Reactions, Mechanism and Structure, by M.B.Smith and J.March, John Wiley & Sons Inc. 2001.			
Lab session (if any)	1.1 Reaction Stoichiometry 1.2 Acid Base Titration 1.3 Crystallization Of A Crude Sample 1.4 Preparation Of Benzene 1.5 Simple Distillation For Miscible Mixture			

Matrix CO/PO

	Knowledge & Understanding							Intellectual Skills					Practical Skills						Transferable Skills			
	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4
CO/PO	A	A	C			B		B	A	C			A	C	B	B			C	A	B	A

A: strongly related
 B: Moderately
 C: Slightly